planet had advanced well on the Sun's disk. No appearance of a halo around the planet was visible, although the outline of the disk was carefully scanned, using in succession several magnifying powers.

Note by Professor Grant.—When the planet had wholly entered upon the Sun's disk I observed its appearance in the Ochtertyre Equatoreal. The disk was of a uniformly black colour and was exceedingly well defined. I failed to perceive any indication of the bright spot to which Mr. Bowden refers, nor could I discern the slightest trace of a nebulous ring around the planet.

Occultation of Mars by the Moon.

The phenomenon was observed by Professor Grant with the Ochtertyre Equatoreal, magnifying power 240. The final extinction of the planet's light occurred at $9^h\ 57^m\ 1^s$ Greenwich Mean Time. The reappearance was not seen.

Measures of the Diameter of Mercury made at the Princeton Observatory, May 6, 1878.

(*Communicated by Professor C. A. Young.*)

In a recent Number of the *Monthly Notices* (see vol. xxviii., p. 423) the result of a preliminary reduction of our observations was stated as $11''\cdot74$.

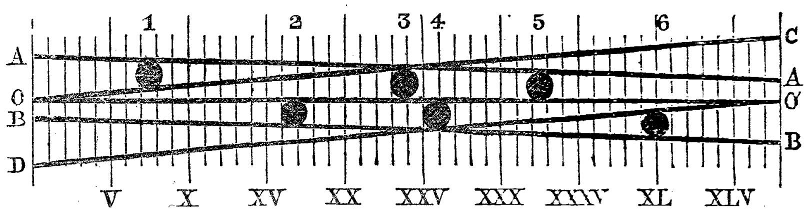
The rigorous reduction has changed this a little more than was anticipated, giving $11''\cdot705$ as the final result.

I had hoped to get a double-image micrometer in season for the Transit; but, failing to do so, adopted the method described below, which, so far as I know, is new and gives very satisfactory results.

The measures were made by bringing the image of the planet between two slightly converging bands or broad lines photographed on glass, and the observation consisted in noting the point where the disk exactly filled the interval between them. The bands were made nearly as wide as the planet, in order to neutralise irradiation. The plate upon which they were photographed was fitted into a micrometer in place of the usual spider-lines, and could be moved by the screw so as to bring any part of the plate to the centre of the field of view. The apparatus was attached to the Merz polarising eye-piece of the $9\frac{1}{2}$-inch Equatoreal, by which the intensity of the light could be graduated at pleasure. Powers of 150, 220, and 490 were used in the observations.

The arrangement of the reticule is indicated in the accompanying diagram, which, however, is not drawn to scale.

As will be seen, it affords six different points at which the measurements can be effected.



The plate was made as follows. A very careful drawing was constructed by Mr. Libbey, the base line OO′ being two feet long and accurately divided into half-inch spaces by a steel rule. This drawing was then photographed upon glass by Professor Brackett with a Dallmeyer rectilinear lens, which formed a reduced copy about half an inch long, distinct and sharp, and without the least distortion which could be detected by careful microscopic measurements made for the purpose. The slope of the bands A and B with reference to O was about 1 in 100, that of the bands C and D about 1 in 50.

The value of the graduated scale was ascertained by observing with the chronograph, on May 14, 16 transits of both limbs of the Sun over all the lines; the results were closely accordant and give—

1 div. (which is $0^{in}\cdot500$ on the original drawing) = $24''\cdot4996 \pm 0''\cdot0075$.

The distances between the bands at the points of measurement were determined in two ways: by direct measures of the glass plate under the microscope; and by measuring the original drawing with vernier callipers reading to thousandths of an inch. The two methods gave essentially the same result in every case; but the latter was preferred, as showing a smaller probable error.

The method pursued was as follows; taking, as an example, the measurement between A and O′ (No. 5 on the diagram):—

A moment's inspection of the record of observations shows that the mean result lies between 33 and 34 on the scale. Accordingly we measure, on the original paper drawing, the distance in thousandths of an inch between the adjacent edges of the bands A and O at the neighbouring graduation marks. The measurements were made by three different persons, and, the means being taken, we get the following numbers:—

At (31) the distance between A and O comes out $0^{in}\cdot2479$;
„ (32) „ „ „ $0^{in}\cdot2422$;
„ (33) „ „ „ $0^{in}\cdot2362$;
„ (34) „ „ „ $0^{in}\cdot2327$;
„ (35) „ „ „ $0^{in}\cdot2298$;
„ (36) „ „ „ $0^{in}\cdot2244$.

Each of these measurements gives an equation of condition of the form $x - ny = a$, when x is the corrected distance between A and O at (31), y is the change of distance corresponding to one division of the scale, and a is the measured distance at any scale division. Thus, for (36) the equation is $x - 57 = 0{\cdot}2244$.

The equations of condition are then solved by the method of least squares, and, with the values of x and y thus found, a corrected series of distances is constructed. These distances are reduced to seconds by the relation.

$$\delta = \frac{D}{500} \times 24''{\cdot}4996,$$

where δ is the distance in arc, and D the distance in thousandths of an inch.

The numbers are then tabulated, and with their help the result of each measurement of the planet is obtained by a simple interpolation at sight.

In the example cited the results are as follows :—

Series 5, A and O.

Scale Division.	Measured distance.	Corrected.	Value. ″
31	247·9	246·8	12·09
32	242·2	242·3	11·87
33	236·2	237·8	11·65
34	232·7	233·3	11·43
35	229·8	228·7	11·21
36	224·4	224·2	10 99

The observations were much interrupted by flying clouds; hence the incompleteness of several of the series. It was intended to make 8 measurements at each point, 4 of the equatoreal and 4 of the polar diameter, but the fourth measurement of the polar diameter failed. The results of the six series are given below :—

(1) Between A and C.

	Equat. Diam. ″	Polar Diam. ″
	11·14	11·47
	11·81	11·94
	11·94	11·60
	12·01	
Mean	11·73	11·67

(2) Between B and O.

	Equat. Diam. ″	Polar Diam. ″
	11·28	12·12
	11·40	11·74
	12·00	11·83
	11·88	
Mean	11·64	11·90

(3) Between C and O.

	Equat. Diam. ″	Polar Diam. ″
	11·49	12·00
	12·10	11·75
	11·80	
	11·64	
Mean	11·76	11·87

(4) Between D and O.

	Equat. Diam. ″	Polar Diam. ″
	11·81	11·91
	12·02	11·40
	11·40	
	11·76	
Mean	11·75	11·66

(5) Between A and O.

	Equat. Diam. ″	Polar Diam. ″
	11·19	11·91
	11·87	11·54
	11·83	11·65
	11·61	11·43
Mean	11·62	11·63

(6) Between B and D.

	Equat. Diam. ″	Polar Diam. ″
	11·67	11·87
	12·13	11·53
	11·67	11·33
	11·46	
Mean	11·73	11·58

	″
Mean of Equatoreal measures	11·704.
,, Polar ,,	11·707.
General mean	11·705 ± 0″·030.

The equatoreal diameter, so called above, is merely the diameter parallel to the celestial equator, and the polar that at right angles to it.

If we reduce the result to distance unity, we get 6″·524, which corresponds to a diameter of 2,290 miles, assuming the solar parallax at 8″·85.

Mr. Libbey and Professor Rockwood also made a few observations: from the measurements of the former we get 11″·56, from those of the latter 11″·76. On the whole, I have thought it best, however, not to incorporate them with my own.

Princeton, N.J.,
1878, *November* 12.

Note on Some Remarks of Mr. Maxwell Hall on the Opposition of Mars. By David Gill, Esq.

In the last Number of the *Monthly Notices** Mr. Maxwell Hall has objected to the method of observing *Mars* with the heliometer as inferior in accuracy to the method of transits employed by him.

* This paper was communicated in November, along with Mr. Gill's papers which appeared in the last two Numbers of the *Monthly Notices.*—Ed.